DOCUMENT RESUME

ED 464 178 UD 034 952

AUTHOR Johnson, Michael P.
TITLE Reforming the Eighth-Grade Student Assignment Process for the Philadelphia Public Schools.
PUB DATE 2000-07-00
NOTE 45p.; Paper presented at the Annual Meeting of the Conference of Minority Public Administrators (28th, Pittsburgh, PA, March 13, 1999). Some figures may not reproduce well.
PUB TYPE Reports - Descriptive (141) -- Speeches/Meeting Papers (150)
EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS Admission Criteria; Admission (School); *Grade 8; Information Technology; *Middle School Students; Middle Schools; *Student Placement; Urban Schools; Vocational Education
IDENTIFIERS Learning Communities; Philadelphia School District PA

ABSTRACT

The eighth grade student assignment project, an initiative of the School District of Philadelphia, assigns students to high school academic programs based on student preferences, academic preparation, program capacity, and desegregation requirements. These programs, called small learning communities (SLCs), emphasize areas such as design and technology, communications, business, and health and draw primarily from students in local middle schools. SLCs are intended to complement existing offerings in Philadelphia's area vocational/technical high schools and selective admissions programs and high schools that draw from a citywide pool of admissions. They ensure that students who need academic support in smaller, more personalized environments can flourish. This paper describes recent modifications to the student assignment process that resulted in a comprehensive, realistic description of business processes, a more accurate method for recording family preferences, modifications to the student assignment process that better reflects student preferences and system constraints, and a new process for meeting management reporting needs. The paper describes other recommendations not yet implemented, including more flexible program reporting to families, a relational database to meet future student processing needs, customer service via the Internet, and management science models to automate the assignment process. (Contains 21 references.) (SM)

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ED 464 178

Reforming the Eighth-Grade Student Assignment Process for the Philadelphia Public Schools

Michael P. Johnson
Assistant Professor of Management Science and Urban Affairs
H. John Heinz III School of Public Policy and Management
Carnegie Mellon University
Pittsburgh, PA 15213-3890
412-268-4270
johnson2@andrew.cmu.edu

Abstract:

The eighth-grade student assignment project is an initiative of the School District of Philadelphia that assigns students to high school academic programs based on student preferences, academic preparation, program capacity and desegregation requirements. This paper describes recent modifications to the eighth-grade student assignment process that resulted in: a comprehensive, realistic description of business processes, a new, more accurate method for recording family preferences and modifications to the student assignment process that better reflects student preferences and system constraints. We describe other recommendations not yet implemented, including more flexible program reporting to families, a relational database to meet future student processing needs, customer service via the Internet and management science models to automate the assignment process.

Keywords: Education, Decision Support, Internet, Policy Analysis

Presented at the Twenty-Eighth National Conference of Minority Public Administrators, March 13, 1999, Pittsburgh, PA.

Last modified: July 6, 2000

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I. Introduction

The School District of Philadelphia (SPD) has for the past four years been engaged in a process to fundamentally change the process by which children are educated in the city of Philadelphia. Called Children Achieving [School District of Philadelphia, 1995], this initiative addresses the following key strategies: (1) high academic expectations for all children, (2) design and implementation of performance measures to assess student progress, (3) reducing the size and role of the central administration and increasing the flexibility and accountability of local schools, (4) ensuring that students entering the educational system are ready to learn, (5) increasing community supports and services to students, (6) providing up-to-date instructional and administrative technology, (7) engaging the public in dialogue regarding educational strategies, and (8) ensuring the availability of adequate financial resources to be used effectively.

In this paper we describe a project called the Eighth-Grade Student Assignment Process that focuses on the third, sixth and seventh strategies. One important aspect of decentralizing authority in the Philadelphia public schools is the increased responsibility of comprehensive high schools to design academic programs that address specific needs of students and train them for well-identified careers in various areas, including college preparation. These programs, called *small learning communities* (SLCs), focus on areas such as design and technology, communications, business, health and so on and draw primarily from students in local, feeder middle schools. SLCs have two main goals: to complement existing offerings in Philadelphia's area vocational/technical high schools (AVTs) and selective admissions programs and high schools (SAs) which draw from a citywide admissions pool, and to ensure that students who need academic support in

smaller, more personalized environments can flourish. Because parents are provided with additional choices for academic programs with limited capacity, a procedure has been developed to enable students to apply for various SLCs, AVTs and SAs and for SPD to allocate students to programs that best match their preferences. The *application and lottery process* is a combination of applications, data entry, student evaluation and random selection of qualified applicants for various programs. The lottery process has historically been performed using mainframe-based COBOL programs operating on non-relational databases.

The eighth-grade student assignment process was revised for two reasons. First, the expansion of the lottery process from AVTs and SAs to include SLCs required a re-thinking of the application and data management processes. Spaces in certain high school programs are very valuable, and SPD anticipated significant difficulty managing the increased volume of applications given the inclusion of SLCs in the planning process. Previous experience with public debates regarding students not admitted to programs they thought should have accepted them made SDP anxious to ensure that the expanded application and lottery process would be fair and be perceived to be fair to all applicants.

The author, along with a cross-disciplinary team of SDP personnel, designed a revision to the application and lottery process that resulted in the following improvements: (1) a comprehensive, realistic description of business process flows, (2) a new method for recording family preferences, (3) a new method for performing student lotteries and post-lottery analysis, (4) a new process for meeting management reporting needs, and (5) a design for a relational database to meet future student information processing needs. We believe that the improved application and lottery process for eighth-grade students,

implemented for academic year 1998-99, has resulted in the following: increased level and perception of family choice in high school academic programs; increased awareness on the part of local school administrators of the need to design academic programs to attract students; increased awareness on the part of policy-makers and information technology analysts alike of the need for modern information technology applications to store, analyze and disseminate data related to application and lottery process inputs and outcomes; and exposure to the notion of decision models to optimize, at least in part, the assignment of qualified students to most-preferred academic programs.

Section 2 places the student transfer process in the context of contemporary scholarly discussions of school choice, restructuring and the use of information systems for improved school administration. Section 3 of this paper presents initial efforts by the School District of Philadelphia to increase choice for academic high school programs, practical constraints to providing popular academic programs in an equitable manner and the role of information technology in facilitating the eighth-grade transfer process. Section 4 presents the innovations of the eighth-grade assignment project in terms of business process re-design, information management and student assignment algorithms. Section 5 describes how recommendations from this project were actually implemented for the 1998-99 school year. Section 6 presents a variety of extensions to the eighth-grade student assignment project that would further enable SPD to meet the needs of parents and students. Particular attention is paid to the untapped role of relational databases and the Internet for providing historical and current information to improve parental decisionmaking, and the role of operations research/management science in designing

mathematical models for student allocations to optimize various objectives of interest. Section 7 concludes.

II. Education Policy and the Student Assignment Process

The eighth-grade student assignment process is an example of a limited form of school choice as implemented by the School District of Philadelphia. The Carnegie Foundation for the Advancement of Teaching [1992] defines school choice as the ability of families of children attending public schools to choose among alternative public academic programs within their school district ("districtwide choice"), alternative public academic programs throughout the state in which they live ("statewide choice") and alternative public and private academic programs ("private school choice" or "voucher plans").

School choice is a hotly debated topic, with analysts such as Boaz [1991], Chubb and Moe [1991] and Peterkin [1991] advocating the full range of choice plans as key to spurring public schools to produce better quality programs, the Carnegie Foundation for the Advancement of Teaching [1992] positioning choice as consistent with the desires of the minority of parents who want such options but insufficient, in itself, to produce systemic change in public education, and Nelson, Carlson and Palonsky [1993] presenting arguments from both sides of the debate. Researchers such as Murphy [1993] and Hallinger and Hausman [1993] have conducted case studies demonstrating the challenges associated with school restructuring and school choice in particular and argue that school-level reforms are essential to making choice policies succeed. While there is relatively little documentation on the view of the School District of Philadelphia itself regarding choice or educational outcomes associated with choice, anecdotal evidence collected by this author

indicates that administrators a limited form of district-level school choice as essential for retaining the confidence of parents of students in the Philadelphia public schools and thus worthy of the business process redesign effort that is the subject of this paper.

The literature on administrative tools applicable to school choice is sparse. The text by Lunenberg and Ornstein [1991], which appears typical of offerings in this area, has little to say on school choice and focuses instead on administrative strategies to deal with financing, school closings, building renovations and related topics.

The literature on management information system applications that might be specifically relevant to implementation of school choice appears sparse as well. An introductory text on information systems for school administrators [Picciano, 1994] has little to say about MIS beyond standard applications for test scoring, energy management and automated telephone calling systems. Song [1992] presents a MIS application to assist administrators in choosing effective educational programs. However, there are a number of studies that address the general issue of design and implementation of MIS for public school systems. Reneke [1994] makes the case for a long-term commitment to change and public access to information to make better decisions when transitioning from mainframe-based systems to client-server systems. Bracci [1999] addresses similar planning issues for implementation of information technology in the classroom. Barrett [1999] examines the level of understanding of school administrators regarding MIS and concludes that extensive training and a view of MIS implementation as a triad of awareness, expectation and perception is crucial is necessary for MIS applications to enhance administrator productivity.

Based on this brief survey of the educational policy and MIS literature, there appears to be little published information on the particular type of choice program embraced by the School District of Philadelphia, and little guidance on the type of business processes and MIS implementation that could best contribute to the success of the eighth-grade assignment process. Subsequent sections of this paper will thus describe this choice program, the modifications made to the business process and the IT implementation in detail.

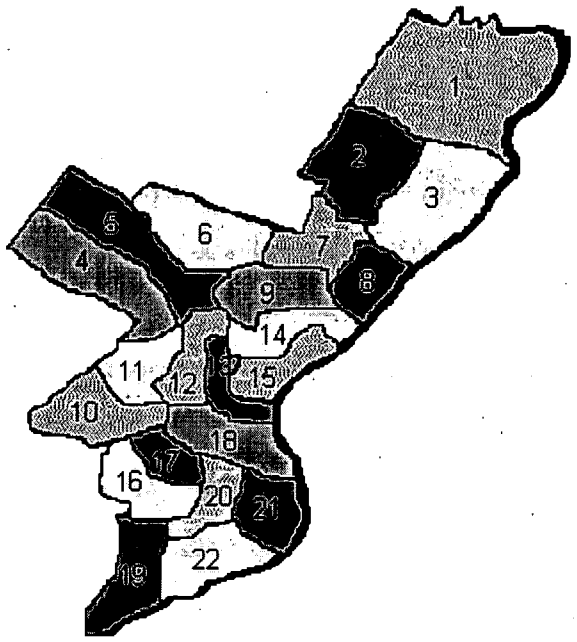
III. Small Learning Communities and the Existing Student Assignment Process

The School District of Philadelphia is divided into 22 *clusters*, or pre-defined geographic areas, that contain neighborhood elementary schools, middle schools and comprehensive high schools (see Figure 1). All students residing in a particular cluster (with exceptions for some students with special needs or those for whom English is a second language) are guaranteed a spot in the local schools. The collection of elementary and middle schools in a particular cluster defines a *feeder pattern* to the local comprehensive high school.

In addition to neighborhood-based schools, SDP has a number of elementary, middle and high schools that accept students from across the city. Some of these schools are area vocational/technical high schools (AVTs) and others are special admissions high schools (SAs), both of which admit students based on academic qualifications beyond minimum requirements.

Cluster Offices

1. Chain	*12.Gratz*
2. Northeast	*13.Penn*
3. Lincoln	*14.Edison*
4. Roxborough	*15. Kensington*
5. Germantown	*16. West Phila.*
6. M.L. King	*17. University City*
7. Fels	*18. Franklin*
8. Frankford	*19. Bartram*
9. Olney	*20. Audenried*
10. Overbrook	*21. Furness*
11. Strawberry Mansion	*22. South Phila.*



Source: School District of Philadelphia Home Page, http://www.philsch.k12.pa.us/dir/clustermap/

Figure 1: School District of Philadelphia Clusters

Traditionally, all local schools could accept students from inside the feeder pattern and, if space permitted, students from outside the feeder pattern. Comprehensive high schools had generally undifferentiated academic offerings for students without special needs, although some offer special programs for e.g. college-bound students. This resulted in a lack of programmatic flexibility for those students who did not attend AVTs or SAs. Combined with the limited number of slots at AVTs and SAs, and the perceived low level of academic quality at comprehensive high schools compared to AVTs and SAs, increasing numbers of parents have reacted by moving their children to private and parochial schools.

The Children Achieving initiative may be seen in part as a reaction to this dissatisfaction with conventional academic offerings.

Small Learning Communities (SLCs) were devised as a way to increase the variety of academic offerings to students with a wide range of interests, academic strengths and special needs (see Table 1 for examples of SLCs within comprehensive high schools). SLCs fall into three categories determined by the method of student acceptance. Some are *open enrollment*—all students who apply are accepted. Others are *criteria-based*—students must express an interest in the program, via an essay or interview, and must meet certain minimum academic and disciplinary requirements. Still others are *special admissions-based*—students must meet certain minimum requirements for consideration for admission and SLC administrators can select from the subset of minimally qualified students those who will enter the program. While all SPD comprehensive high schools have SLCs, most of these programs are open enrollment.

While every student in a comprehensive high school's feeder pattern is guaranteed a slot in the local comprehensive high school—and perhaps in a particular SLC--parents and students are encouraged to evaluate the range of SLCs offered to choose one best matching the interests and abilities of students. In addition, students are encouraged to apply to any SLCs—within the local feeder pattern or not--that interest them. Thus, schools are encouraged to devise academic offerings that meet student needs and result in beneficial academic outcomes, or face the possibility of losing enrollment.

School	Open Programs	Criteria-Based	Special Admissions
Lincoln		Design and Technology Business Technology Fast Track at Swensen ...	
M.L. King	Auto/Computer Engineering (ACE) Travel and Tourism (CIS) Business Institute		
Overbrook	Technology Target Service Business Institute ...		Scholars Magnet Music Magnet Fine Arts Magnet Motivation
Washington	Performing Arts College Community for International Affairs Health Tech – 2000 and Beyond ...	Applied Electrical Academy Business Academy HRT Academy Hi-Tech SLC	

Table 1: Examples of Small Learning Communities Within Comprehensive High Schools

The task then fell to the Office of Standards, Equity and Student Services (OSESS) of SDP to devise an application mechanism to determine which eighth-graders, facing the choice of SLCs, AVTs and SAs in the following year, would be assigned to which program. For the 1997-98 school year, SDP modified an application process originally intended for AVTs and SAs alone by which students could simultaneously express interest in various programs and submit their academic qualifications. This process required that parents and students fill out up to three forms—one for SLCs, another for AVTs and a third for SAs. SDP would then collate the various forms, enter them into the district information system, and send student information to the various programs. Students would first be *deselected*, i.e. removed from the pool of potential students, if they did not meet minimum qualifications for the academic program. Next, the Information Technology (IT) Department of SDP would run a series of computer programs (dubbed the *lottery*) to assign

students to their most-preferred programs, or, if there was insufficient space for all qualified applicants, devise a waiting list from which applicants would be randomly selected as spaces for particular programs opened up. Due to public school desegregation requirements, and the requirement that local (inside-feeder) students get priority for SLCs, for each SLC lotteries were conducted for four groups of applicants: inside-feeder whites, inside-feeder non-whites, outside-feeder whites and finally outside-feeder nonwhites.

Parallel to this process, SAs, which had complete control over their admissions processes, and AVTs, which have somewhat less control, would evaluate potential students and devise waiting lists and pools of admitted students on their own. When SLCs, AVTs and SAs made their preliminary admissions decisions (to admit, put on a waiting list or not to admit), SDP would communicate these decisions to parents, who would then choose the single program into which the student would enroll.

This procedure suffered from a number of serious flaws. First, parents had very little knowledge about the various academic programs, especially the SLCs. In particular, there was little information available about the number of slots available to inside-feeder and outside-feeder students and little information about the popularity of various programs. Thus, parents had little guidance as to the likelihood that their children might be accepted to various programs.

Second, the multiplicity of forms resulted in many incomplete or multiple copies of forms for the same student submitted to SDP. In particular, parents reasoned, incorrectly, that submitting multiple forms would increase their children's chances of being admitted to certain popular programs.

Third, IT's software used to run the lottery was written in COBOL and used data stored in variable-length data tables stored on a mainframe. The exact algorithms used were known only to a very few, and the programs took a long time to run. Limitations of the software and hardware resulted in inefficient data storage schemes, an inability to construct an audit trail for admission decisions resulting from the lottery, and a relatively high incidence of programming bugs that made the lottery process longer than necessary. This limitation led to the fourth major problem: the complexity of the lottery process and the high level of user intervention increased the likelihood that certain students might not be admitted to programs that were their most-preferred and for which they were qualified, and that certain other students might be admitted to programs that were not their most-preferred or for which they did not qualify.

Finally, as the Children Achieving initiative was ongoing, the number of SLCs was forecast to increase significantly in upcoming years, putting even more pressure on SDP, and in particular IT and OSESS, to manage the increased demand for these programs.

IV. Policy and Technical Modifications

The eighth-grade student assignment process was modified in three specific ways by a team composed of SDP staffers from the Office of Information Technology, Office of Standards, Equity and Student Services, Office of Student Placement and Office of Assessment and Accountability, and the author. First, the existing business processes behind the assignment process were mapped onto a process flowchart, enabling staffers to identify bottlenecks and to set realistic due dates for task completions. Second, high school program application forms was redesigned to allow parents to fill out a single form for all

academic programs, including preferences for SLCs and AVTs. Third, the process by which student applicants were assigned to academic programs was modified to better enable SDP to respect student preferences and program capacities. Results from implementation of these changes are examined in Section 4.

In addition, proposals were made, but not yet implemented, to make the creation of management reports regarding the student assignment process easier and more flexible for non-technically-skilled staff, to design and implement a relational database for student information to augment or replace the current mainframe-based system, and to make historical information regarding the student assignment process more accessible to parents and students. These proposals are examined in Section 5.

Mapping and modifying the business processes associated with student assignment required, first, a common, cross-team understanding of the "big picture" as well as the process at a more detailed level. At the highest level, as shown in Figure 2, the student assignment requires inputs composed of academic and preference information from the student and his/her family, capacity and feeder patter information from SDP, and produces outputs composed of actual academic program assignments used by the student and his/her family and by the SDP student information system.

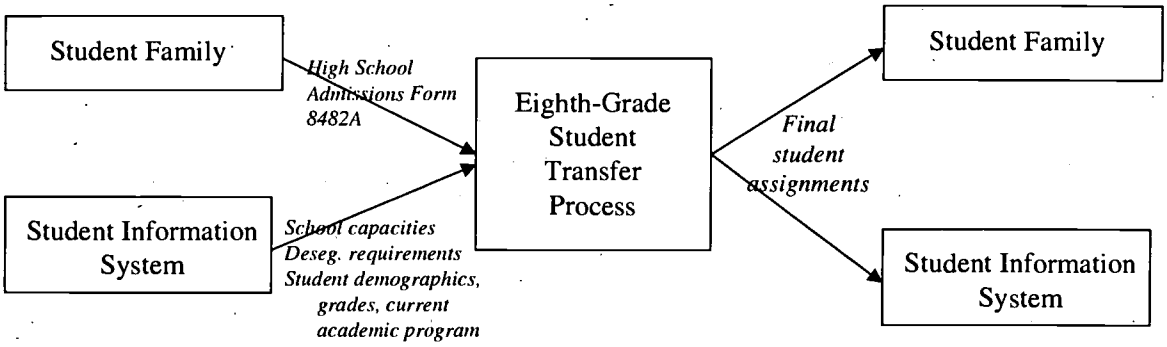


Figure 2: High-Level View of Student Assignments

A more detailed view of the student assignment process, shown in Figure 3, illustrates the following key steps. First, student applications to academic programs are entered into the SDP information system. Second, the list of applicants is reduced by excluding students that do not meet minimum requirements for various programs. Third, the reduced list of student preferences for SLCs and AVTs are input to the student assignment lottery process while, in parallel, SAs make acceptance decisions. Fourth, modifications are made to lottery results for students not assigned to any SLC. Fifth, parents and students are notified, in most cases, of initial assignment decisions and asked to choose a single program to which a student will register for the upcoming fall. Finally, program choice information from parents, and, if necessary, manual assignments for hard-to-place students are input to the student information system.

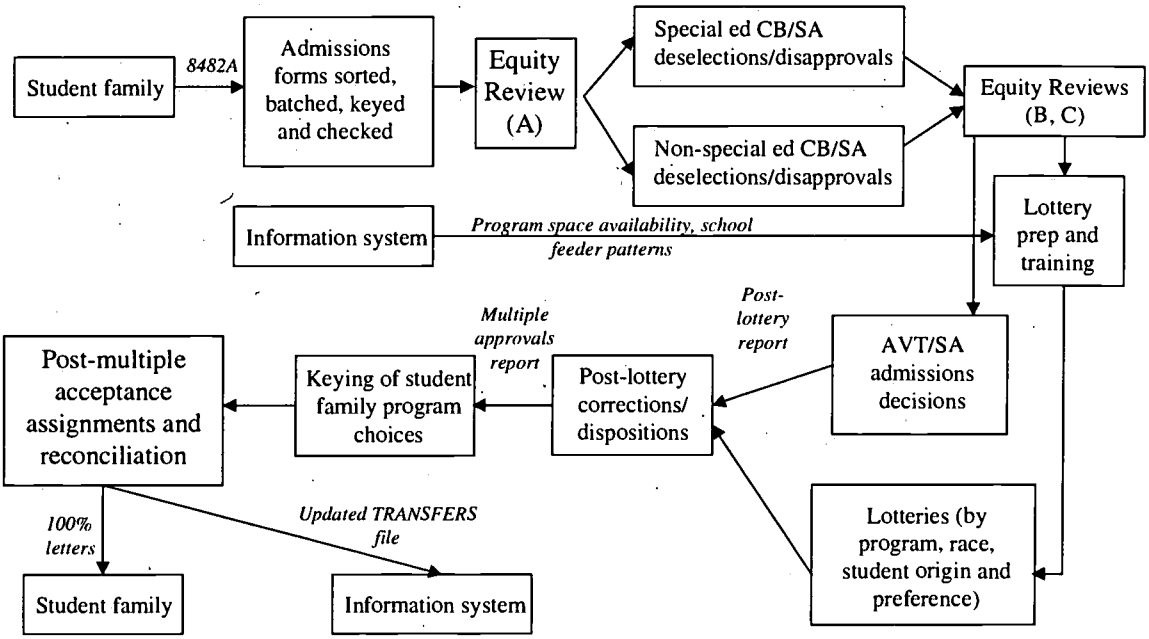


Figure 3: Student Assignment Process Details

As indicated earlier, application forms for the student assignment process for academic year 1997-98 were considered to be overly complex. The main problem with the old process was that parents were expected to fill out one form for each set of SLCs, AVTs and SAs for which they were interested and to rank, separately, their preferences for the various SLCs and AVTs. Parents also had to review and possibly modify three separate student data forms listing performance in academic classes and standardized tests. It was then left to the Office of Information Technology to enter data from these separate forms into separate data structures, with obvious redundancies. OIT also had to reconcile the different preferences without knowledge of how families might rank the various academic programs together, potentially wasting processing time on most-preferred programs in categories that were really not, overall, of great interest to parents. Finally, parents, knowing that students were selected for very popular programs using a lottery process,

reasoned that their children's chances for acceptance would be increased if they filled out multiple applications. Again, OIT was burdened with the task of culling duplicate application forms for three separate programs, a tedious and manpower-intensive process.

From the beginning of the project our goal was to design a single application form for SLCs, AVTs and SAs that would minimize duplication in data entry and storage and best represent parent and student preferences for the various academic programs, focusing interest on the key distinctions between *inside-feeder* and *outside-feeder* programs, and *open-enrollment* and *criteria-based* programs versus *special admissions* programs.

The reasons for these distinctions are the following. First, since the majority of SDP students are (1) guaranteed spaces at open enrollment academic programs at their neighborhood comprehensive high school and (2) likely to enroll in programs, open-enrollment or criteria-based, at their neighborhood comprehensive high school due to simple proximity, programs in these high schools have reserved the majority of their program spaces for students living in the local feeder pattern ("inside-feeder"), and a smaller fraction of program spaces for students living outside the local feeder pattern ("outside-feeder"). Second, since the majority of SDP students are insufficiently prepared academically for special admissions programs, it is important to distinguish between SAs and non-SAs, especially if a particular SA is housed within an applicant's local comprehensive high school.

Thus, the new High School Admissions Form (HSAP; see Appendix 2) groups academic programs in three categories: inside-feeder (both open-enrollment and criteria-based programs), outside-feeder (both open-enrollment and criteria-based programs) and special admissions programs (both inside-feeder and outside-feeder). In addition, the

HSAP explicitly mentions that the outside-feeder and special-admissions sections of the form are *optional*, recognizing that parents should, at the very least, select, from among the inside-feeder programs to which their child is most likely to be admitted, those that are most preferred.

In both the inside-feeder and outside-feeder sections, parents are asked to rank academic programs in descending order of preference. (Parents are *not* asked to rank special-admissions programs in order of preference because in this case the process of selecting candidates is entirely within the discretion of the SAs.) Then, parents are asked to aggregate their preferences by listing the four most-preferred programs (two inside-feeder and two outside-feeder programs). This process was intended to assist parents in refining their preferences for those programs students are most likely to be accepted.

We now examine the actual process by which students are assigned to academic programs based on the HSAF. This process was modified as a result of changes to the HSAF and also to reduce politically sensitive instances of students not receiving admittance to most-preferred programs even if they could prove that other students, for whom a particular program was *not* their most-preferred, were admitted anyway.

Recall that applicants can be deselected (removed from consideration) from criteria-based programs if they do not meet minimum requirements, thus we consider only those students that qualify for criteria-based programs. Denote by $i = 1, 2, .., N$ the set of non-SA programs[1] and denote by s_i the number of slots available for program i. Denote by L^i_1 the set of students who have listed non-SA program i as their most preferred program, L^i_2 the set of students who have listed program i as their next-most-preferred program, and

[1] By "non-SA program" we treat slots for inside-feeder vs., outside-feeder and white vs. black applicants as separate programs.

so on. Students in each list L^i_j , $j = 1, 2, .., P$ for some maximum preference list size P are randomly sorted so as not to give undue advantage to those who have applied earliest. For each non-SA program i, the initial lottery considers only students on lists L^i_1 for preliminary acceptance: students in L^i_1 whose random ranking do not exceed program capacity are granted preliminary acceptance to programs. Students in L^i_1, L^i_2, ...whose random rankings exceed program capacity are put on a "virtual waitlist". In parallel to this process, AVTs and SAs make initial acceptance decisions[2].

After initial lottery and special admissions programs determinations, students fall in different categories:

- Those who have been accepted to their most-preferred inside- and/or outside-feeder SLC and *at least one* SA program (Category A)[3];
- Those who have been accepted to their most preferred inside- and/or outside-feeder SLC, have been accepted to *no* SA programs, but are on the waiting list for *at least one* SA program (Category B);
- Those who have been accepted to their most preferred inside- and/or outside-feeder SLC, have been accepted to *no* SA programs, and are not on the waiting list for *any* SA programs (Category C);
- Those who have *not* been accepted to their most preferred inside- and/or outside-feeder SLC but have been accepted to one or more SA programs *or* are on the waiting list for one or more SA programs (Category D);

[2] AVTs and SAs usually approve more students for admission than there are available slots, knowing that some of these students will choose to enroll in other programs. This issue is examined in more detail further in the section.

- Those who have *not* been accepted to their most preferred inside- and/or outside-feeder SLC, have been accepted to *no* SA programs, and are not on the waiting list for *any* SA programs (Category E);
- Those who have not returned the HSAF (Category F).

SPD will communicate with certain families post-initial lottery, depending on the initial disposition of that family's child:

- Categories A and C: The family receives a letter, called a Multiple Acceptance Report (MAR) listing all program acceptances and a request to choose a single program for admission in the fall. A family's choice in this situation is final and cannot be rescinded.
- Category E: The family receives no correspondence from SPD. SPD will attempt to provide the child with his/her highest-preference SLC after a reconciliation phase.
- Category F: The family receives no correspondence from SPD. SPD will manually place the child in an inside-feeder, open-enrollment program after the reconciliation phase.
- Categories B and D: The family receives no correspondence from SPD and awaits final disposition of SA applications.

[3] SA criteria are so similar that most students who meet the criteria for one program more than likely can be approved for all programs.

After families in categories A and C accept admission to a student's particular program, that student's name is struck from *all other* SLC program lists. This opens up slots for other children who were not admitted to programs in the initial lottery.

After processing Multiple Acceptance Report responses, a student has either:

- Accepted admission to his/her first-most preferred non-SA program, or
- Accepted admission to an SA program, or
- Chosen to await SA waiting list dispositions, or
- Been denied admission to his/her most-preferred SLC and has been denied consideration for SA programs.

It is the last two groups whose needs SPD attempts to meet in this phase. To provide order to the reconciliation process, non-SA programs with open slots are considered in random order first for students for whom the program is outside their feeder, and second for students for whom the program is inside their feeder. (Certain programs are considered twice in this scheme). For a particular non-SA program i, after spaces appear in the list L^i_1 of applicants for which program i is their most-preferred, students remaining on L^i_1 but not yet admitted fill open slots in randomized sequential order until either:

- All eligible students in L^i_1 receive admittance to the program, or
- All available slots for the program are filled.

Students in L^i_1 who have not been admitted to any SA programs have their names stricken from consideration for all other non-SA programs $k \neq i$ in which they have expressed interest immediately after their admissions occur. These admissions, considered to obey student preferences, are final and cannot be rescinded. Note that families have no choice in this admission process. In addition, some students on SA waiting lists (and, possibly, in L^i_1) are subsequently accepted by one or more SAs. These families then choose between one of the SAs (and, possibly, non-SAs) to attend. These students' names are stricken from all non-SA waiting lists as well, freeing up yet more space in non-SAs for students not yet accepted to their first-most preferred non-SAs.

After lists L^i_1 for all programs i have been considered, and updated, in the reconciliation phase, practically no students not yet admitted to their first-most-preferred non-SA programs can ever be so admitted in the future. So consideration now shifts to students' second- and lesser-preferred programs. Post-MAR reconciliation is now repeated for those students who have not yet been admitted to any non-SA programs, in descending order of student preference.

A problem with the algorithm described above is that, given the amount of human intervention in this process, it is still possible for students to be assigned to their second- or less-preferred non-SA programs even if space becomes available in their first-preferred non-SA program. It is possible that operations research/management science algorithms could more consistently allocate students to programs based on expressed preference requiring minimal human intervention in the form of post-MAR processing.

Two consequences of this admissions process are that (1) some non-SA programs may have higher-than average concentrations of students for whom the program was not

their first-most preferred program, an indication that these programs should work to make themselves more desirable, and (2) some teacher reallocations may be necessary to ensure that every student does have a slot in a (possibly less-preferred) local program.

V. Implementation of Recommended Changes

In this section we examine the experiences of SDP in implementing the changes described in the previous section for the academic year 1998-99. In general, SDP has found that the student transfer process has proceeded quite smoothly so far, even as deadlines for various processes were advanced substantially. Unfortunately, no effort was made, to the author's knowledge, to collect data specifically to enable the modified student transfer process to be formally evaluated.

An initial change to the planned student transfer process occurred when, to coordinate special admission program acceptances and lottery processing, the deadline for completion of the high school transfer process was advanced from April 23, 1999 to March 10, 1999, as indicated in Appendix 1. This required data entry of initial student applications to be completed much earlier than anticipated, resulting in substantial overtime and outsourcing costs incurred by SDP. However, from this experience SDP learned that outsourcing the data entry process may lead to potential future economies in this area.

The high school transfer program was widely publicized throughout Philadelphia in the months leading up to the application deadline data of November 20, 1998 via citywide fairs and presentations at local high schools. SPD's preliminary assessment is that a large majority of families with children entering high school had a substantial understanding of

the variety of academic program choices they faced and filled out the High School Admissions Form correctly. However, a lack of historical information about trends in student acceptance rates for various programs, and a lack of public information regarding the forecast number of inside-feeder and outside-feeder slots to be made available made it difficult for families to make most-informed choices for space-limited and academically rigorous high school programs.

The primary change to the processes described in the previous section concerns the actual lottery process. As Table 2 indicates, for two of the three high schools listed, the number of out-of-feeder SLC applicants not deselected initially far outstrips available capacity. This is a consequence of the fact that most neighborhood comprehensive programs that do not draw from a citywide student applicant pool have very few openings for outside-feeder students. (For the third high school, the number of outside-feeder slots is a consequence of the low inside-feeder enrollment, as many students in that high school's cluster attend private or parochial schools.)

Also of interest is the large number of applicants, both inside-feeder and outside-feeder, who are removed from consideration for the criteria-based SLCs in the first and third high schools listed below. This is an illustration of the fact that the current achievement level of many SDP students excludes them from consideration for non-open-enrollment programs. However, the demand for such programs is substantial, indicating that incentives exist for students currently in the seventh grade to improve their academic performance to be considered for criteria-based programs in the coming year. (Again, the relatively large numbers of students accepted for consideration for SLCs in the second high school is a function of that school's need for students to fill excess capacity.) Table 2

indicates that in general, given high demand for outside-feeder SLC slots, i.e. that L^i_1 substantially exceeds s_i, only students for whom these programs are most-preferred will be admitted. On the other hand, many students in L^i_1 will not be admitted to program i, thus it will be necessary to consider their second- or lower-ranked choices, or, at worst, assign them to an open-enrollment SLC in their local comprehensive high school.

High School /SLC*	**Available Regular Education Slots**		**Number of Students Applied/Deselected**			
	Inside-Feeder	Outside-Feeder	Inside-Feeder		Outside-Feeder	
			Applied	Selected	Applied	Selected
HS#1						
SLC1	85	6	326	299	312	98
SLC2	85	6	321	109	217	108
SLC3	85	6	363	146	466	102
HS#2						
SLC1	70	140	223	193	1,071	528
SLC2	40	100	228	188	734	371
SLC3	65	150	223	198	1,186	461
HS#3						
SLC1	87	0	538	72	338	21
SLC2	56	2	602	53	995	11
SLC3	63	0	545	474	512	463
SLC4	97	15	619	124	634	67

*Note: High School and SLC names suppressed for confidentiality

Table 2: Criteria-Based SLC Program Availability for First-Choice Applicants

Another area of interest regards student admissions to AVTs and SAs. Because students who are admitted to a single AVT (SA) are likely to have been admitted to all AVTs (SAs) to which they have applied, AVTs and SAs must account for the fact that the number of students approved for their programs can exceed substantially the number of students who actually enroll. The number of students approved for AVTs/SAs is called the

"yield factor" (technically a yield factor would equal (# available slots ÷ # students qualified for admission)). Since students are allowed to rank the AVTs for which they have applied by preference, AVTs use a lottery to choose from the number of students meeting minimum qualifications for admission a smaller number of students likely to consider enrollment in the AVT. From this smaller number of qualified students it is hoped that the number of students who accept that AVT matches the number of slots available. Because SAs are not ranked and because they have so much control over their admissions process, selection decisions, rather than a lottery, result in their yield factor.

Table 3 contains results on applications, selections, available slots and yield factors for three AVTs.

AVT*	Yield Factor	Total Regular Education Slots	Number of Students Applied/Deselected	
			Applied	Selected
HS#1	400	245	1,778	800
HS#2	700	498	2,730	771
HS#3	800	525	3,328	831

*Note: High School names suppressed for confidentiality

Table 3: AVT Program Selection Results for First-Choice Applicants

This table illustrates that AVTs need to notify about twice as many students of acceptance to their programs (via a lottery) than actually register. It is possible that if all programs notified students of their selection/deselection status earlier in the assignment process, and if students were allowed to rank AVTs and SA by preference, yield factors would decrease and AVTs and SAs might be better able to gauge demand for their programs. This is a point that we revisit in the next section.

VI. Potential Information Technology and Management Science Improvements to the Student Assignment Process

There are a number of recommendations made by the author at the conclusion of the student assignment project that, though favorably received, were not implemented for the next current academic year and which may not be implemented in the near future given SDP resource limitations. We present them here to illustrate what a student assignment process is capable of.

First, note that SDP chose to create a "super-preferences" category composed of the top two inside-feeder and outside-feeder SLCs. This was done to assist parents refine their preferences and prevent the possibility of many students applying for highly-desirable outside-feeder programs they have no realistic chance of being accepted to. Note also that SAs cannot be ranked by parents; partly because these programs are so desirable that it is assumed that an acceptance to them will trump acceptances to other SLCs. Thus, students and parents have imperfect information about AVTs and SAs at the time the HSAF is filled out. This results in an assignment process perhaps excessively complex from the information management and customer service perspectives: some applicants are automatically accepted to most-desired programs after the initial lottery, others accept one of a number of competing programs after the initial lottery and still others must await the outcome of the "backfill" procedure in which students who have accepted (or been assigned to) certain programs are removed from lists of other, less-preferred programs.

If, alternatively,

- Parents and students had information on past trends in acceptance rates for a wide variety of programs,
- It were possible, via an on-line, automated application system replacing HSAF for students to immediately determine the criteria-based *and* SA programs for which they met minimal qualifications,

then it might be possible for parents and students to construct a single list of *all* programs for which they are interested, in descending order of preference. Subsequently, the result of the first lottery process and notification by SAs of acceptances might result in a greater number of students choosing academic programs after multiple acceptance report letters are sent. Of course, some manual processing would be necessary to deal with students whose applications are incomplete or missing. In addition, SDP policy that attempts to give students their first-most-preferred program (as opposed to the most-preferred program following, say the first re-scan of the wait lists) would again require multiple lottery processes. Each assignment process could be performed with linear programming. We illustrate this prototype model later in the section.

Another project recommendation not yet implemented is the creation of a fully relational database for student information to enable the student assignment process to handle an arbitrarily large number of preferences (i.e. P as large as necessary) and to enable creation of an audit trail of the process for a given year (i.e. multiple lotteries) and over multiple years. The current student information database is composed of variable-length record tables that reside on a mainframe computer and which used COBOL to run programs and queries. The architecture of this database is difficult to modify, system

documentation hard to find and programs and queries time-consuming to create and run; this is no less so for the student assignment lottery process.

As SDP's Information Technology Planning Project: Information Technology Plan [School District of Philadelphia 1998a] makes clear, it is crucial that SDP adopt enterprise-wide client-server relational database applications to make the best possible operational decisions with the huge volume of data at its disposal. An example of a relational database design that could be adapted for the student assignment process based on standard IT design principles [Rob & Coronel, 1997] is shown in Figure 3. This type of database design could also be used for on-line applications for the student assignment program, something that will be difficult to implement in a traditional mainframe-based environment.

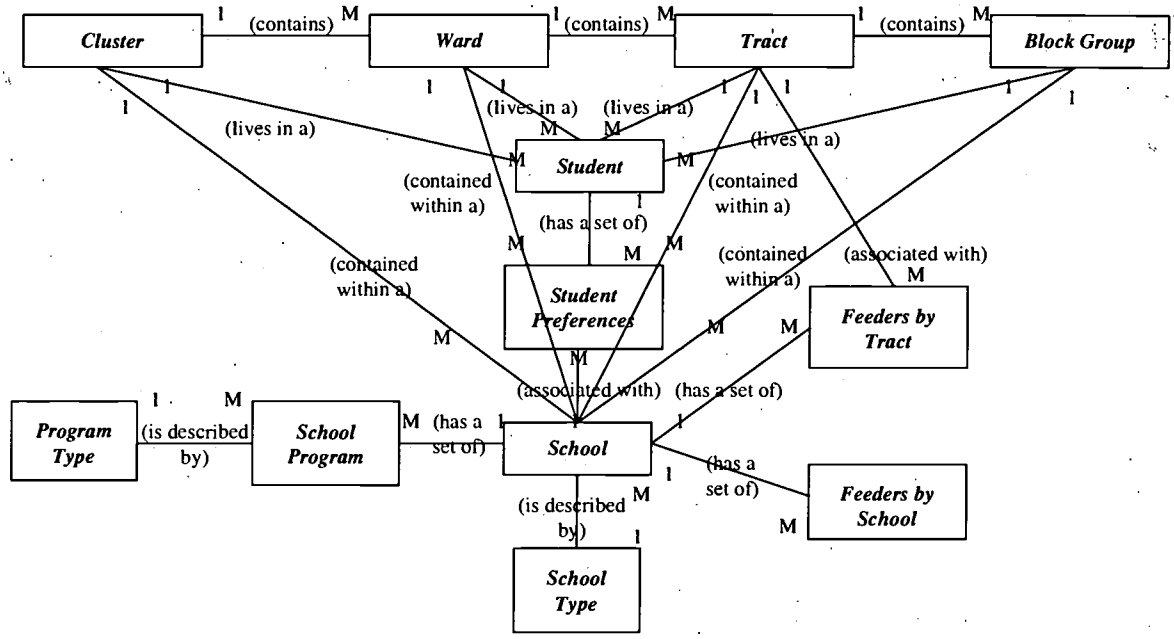


Figure 4: Sample Entity-Relationship Model for SDP Student Information System

An enterprise-wide client-server relational database application would also make it possible for analysts, administrators, counselors and parents to quickly access a wide variety of reports regarding (but not limited to) the student assignment process. While SDP has developed a character-based, mainframe-resident report generator called TRACKER [School District of Philadelphia, 1998b], this application offers limited flexibility in the type and format of reports, cannot send reports to local printers and, because of its mainframe orientation, may induce the *perception* of requiring specialized knowledge to use.

True on-demand reporting would allow end-users, with minimal training, to specify the data variables to report on, the type of analysis to be performed (e.g., cross-tabulations, averages by year, etc.) and the report format. Such an application enabling parents, for example, to determine which programs are most likely to accept their children, would enable SDP to significantly advance towards a goal of improved customer service

Another aspect of increased availability of information regarding the student assignment process is the prospect of providing services via the Internet. One can imagine, for example, that a Web page allowing instant perusal of current student assignment program acceptance rates for various programs over various years, or on-line submission of student assignment program applications, would avoid to some degree the capital-intensive issues of network design and client-server application design to account for a large area such as the School District of Philadelphia. This information could also be accessible to parents and students from any public terminal, for example those in public libraries or community centers, rather than relying on school counselors to make proprietary applications available. Provision of information in this form would also serve

as an incentive for increased use of IT and the Internet, consistent with the recommendations of the recent report Falling through the Net: Defining the Digital Divide [U.S. Department of Commerce, 1999].

Yet another business issue that could be modified in the future is the issue of which applicant households receive multiple acceptance report letters after the first lottery process. As indicated in the previous section, only a minority of all parents--those whose children have been accepted into their most-preferred SLC as well as an AVT and/or an SA, or those who have been accepted into their most-preferred SLC and have been accepted to no AVTs or SAs--receive letters from SDP confirming this fact. Thus, there is the possibility of misinformation among parents who do not receive letters, or fears that their children will not be admitted to most-preferred programs. It may be possible for SDP to notify all parents of high school program applicants in writing of the status of their children's applications, all the while ensuring them that SDP will make every effort to ensure that students are admitted to their most-preferred programs.

Finally, there are management science/operations research models that could make the student assignment program even more efficient and consistent. We first present two alternative integer programming models based on the well-known *assignment problem* [Woolsey, 1998]. Sets, data and decision variables are defined below:

Sets:

i = 1, 2, ..., M: index of students seeking admission to various programs

j = 1, 2, ..., N+1: index of available academic programs (j = N+1 is a default open-enrollment program in the local comprehensive high school)

k = 1, 2, …, P: index of possible program rankings (k = 1 is most-preferred, $k = P$ is least preferred)

Data:

r_{ij} = ranking assigned by student i for program j ($r_{iN+1} = M$, where M is a large number)

a_{ij} = 1 if student i has either met minimum requirements or has been approved for program j,

= 0, otherwise

I_{ij} = 1 if student i is within the feeder pattern for program j,

= 0, otherwise

O_{ij} = 1 if student i is outside the feeder pattern for program j,

= 0, otherwise

S^I_j = available inside-feeder capacity of program j

S^O_j = available outside-feeder capacity of program j

q^k_{ij} = 1, if student i designates program j as kth-preferred,

= 0, otherwise

Decision Variables:

x_{ij} = 1, if student i is assigned to program j,

= 0, otherwise

Model SA:

$$\min \sum_{i=1}^{M} \sum_{j=1}^{N+1} r_{ij} \cdot x_{ij} \tag{1}$$

$$s.t. \sum_{j=1}^{N+1} x_{ij} = 1 \forall i \tag{2}$$

$$\sum_{i=1}^{M} I_{ij} \cdot x_{ij} \leq S_j^I \ \forall j \tag{3}$$

$$\sum_{i=1}^{M} O_{ij} \cdot x_{ij} \leq S_j^O \ \forall j \tag{4}$$

$$x_{ij} \leq a_{ij} \ \forall i, j \tag{5}$$

$$x_{ij} \in \{0,1\} \forall i, j \tag{6}$$

Model SA minimizes the total dissatisfaction perceived by all students as a result of program assignments (equation 1), subject to a number of conditions. Constraints (2) ensures that all students are assigned to an academic program, even if the program is a default, inside-feeder, open-enrollment program. Constraints (3) ensure that the number of inside-feeder students assigned to each program not exceed the forecast inside-feeder capacity. Constraints (4) ensure that the number of outside-feeder students assigned to each program not exceed the forecast outside-feeder capacity. Constraints (5) ensure that a student cannot be assigned to any program unless that student has met minimum requirements (for open-enrollment or criteria-based SLCs) or has been formally accepted (for special admissions SLCs, AVTs and SAs). Constraints (6) require that the decision variables be binary.

SA suffers from two flaws, however. First, objective (1), while acceptable on broad social welfare grounds, could generate assignments in which some students assigned to less-preferred programs when there may have been space available in more-desirable

programs, resulting in political opposition to the assignment scheme. Second, objective (1) does nothing to ensure that students get their first-most-preferred program, a key policy priority of SDP. The first objection could be addressed by converting objective (1) to a quadratic formulation, as below:

$$\max \sum_{i=1}^{M} \sum_{j=1}^{N+1} (r_{ij} \cdot x_{ij})^2 \tag{7}$$

This new objective strongly penalizes assignments that are undesirable from the student's point of view. Unfortunately, this quadratic assignment problem can be substantially more difficult to solve to optimality than the linear quadratic assignment problem.

The second objection could be addressed by replacing objective (1) with a new objective as below:

$$\max \sum_{i=1}^{M} \sum_{j=1}^{N+1} q_{ij}^{1} \cdot x_{ij} \tag{8}$$

In this case, we maximize the total number of students who receive their most-preferred program choices. In fact, objective (8) could be extended to proportionally weight similar expressions for the total number of students who receive their second-most-preferred program, third-most-preferred program, and so on.

Because objectives (1) and (8) address very different policy needs, we could formulate a multiple-objective optimization problem, in which (1) and (8) are jointly

optimized with respect to constraints (2) – (6). Using the multiobjective programming techniques [Cohon, 1978], one could solve this problem to generate a tradeoff curve (Pareto surface), in which pairs of objective function values corresponding to alternative solutions to the multiobjective problem are displayed in a two-dimensional plot. Decisionmakers may thus select the solution that is the most-preferred compromise between the two competing objectives.

Additional analysis of model results could be performed to determine how *equitable* various solutions are with respect to different student groups, for example by calculating the percentage of total students who received their first-, second-, ...least-preferred program options. Alternatively, the attractiveness of various academic programs could be measured by calculating, for each program, the fraction of students assigned to it for which the program was their first-, second-, ...least-preferred option.

Finally, optimization models such as (1) – (6) and its variants could be used as a basis for exploratory policy analysis related to eighth-grade student assignment. For example, if distance traveled by students to various programs is an issue, another objective that minimizes the total distance traveled by students to the high schools to which they have been assigned could be analyzed, separately or in various combinations with objectives (1), (7) and (8). Alternatively, this criterion could be treated as an additional constraint to the optimization model. Using the model to explore the impacts of demographic changes might also yield useful results: additional data and constraints could be defined to enforce desegregation guidelines by program. Such a model would be useful in assessing the change in racial composition of inside-feeder and outside-feeder students by program under various modeling assumptions.

Another variant of optimization model (1) – (6) could explore the impact on teacher assignments of increased student choice: a measure of teacher reassignment costs given student assignments to programs that are significantly below capacity could be implemented as a constraint on the total costs of student assignment schemes, or as an objective to be minimized. It is even possible to imagine formulating a model similar to (1) – (6) to be used to minimize teacher dissatisfaction with classroom assignments from year to year!

Whatever optimization model is chosen for analysis, the result is likely to be increased insight into the range of values for important policy metrics as measured by decision variables such as student assignments to programs (or teacher assignments to programs).

VII. Conclusion

In this paper we have examined a policy change by the School District of Philadelphia associated with eighth-grade student assignments to high school academic programs that (1) intersects a number of different strategies as contained in SDP's Children Achieving and Information Technology Plan initiatives, (2) requires knowledge of a variety of functional areas in education, management information systems, business analysis and policy analysis and (3) may result in a significant new emphasis placed by SDP on business principles such as customer satisfaction and analysis of market demands.

The modified eighth-grade student assignment process has resulted in a number of useful organizational and policy insights. First, we have seen that by providing detailed information on and choice regarding high school academic programs to students and

parents, students will be encouraged to improve their academic performance to enable acceptance to most-desired programs, and schools will be encouraged to design more popular programs and discard unpopular ones. Second, SPD's increased focus on customer service via the student assignment process will require significant rethinking of fundamental business processes and the information technology infrastructure that supports these processes. In particular, business processes should focus on assessing customer needs and preferences and designing products that match these needs and preferences. In addition, IT infrastructure should support enterprise-wide, on-demand analysis of data, based on well-organized and flexible data structures. Third, there is an increased need for interdisciplinary teams that cross traditional functional boundaries in order to address bottom-line customer concerns. In sum, SPD is similar to public housing agencies and other government bodies in realizing that it has to increasingly act like a business in order to retain customers and, more importantly, retain confidence in the public good represented by public education.

We have presented a number of important changes to the eighth-grade student assignment process, some of which have been implemented and others of which may form the basis for research, at least in the short term. Key implemented changes include: design of key business processes as a flow chart and time line, redesign of high school application form and redesign of student assignment and lottery process. Important areas of research and development include: design and implementation of a fully relational database for student information, increased enterprise-wide networking and Internet connectivity for various real-time applications, and design and implementation of optimization models for both short-term decisionmaking and longer-term policy analysis.

Acknowledgements

This project benefited enormously from the support of Dr. Mitchell Chester, Acting Director of the Office of Information Technology and Executive Director of the Office of Accountability and Assessment, and Ms. Gwendolyn Morris, Special Assistant to the Executive Director of the Office of Standards, Equity and Student Services. This paper is based on a presentation given at the Twenty-Eighth National Meeting of the Conference of Minority Public Administrators, Pittsburgh, PA, March 13, 1999. Special thanks to Susan McElroy and Robert Strauss for their helpful comments on an earlier draft.

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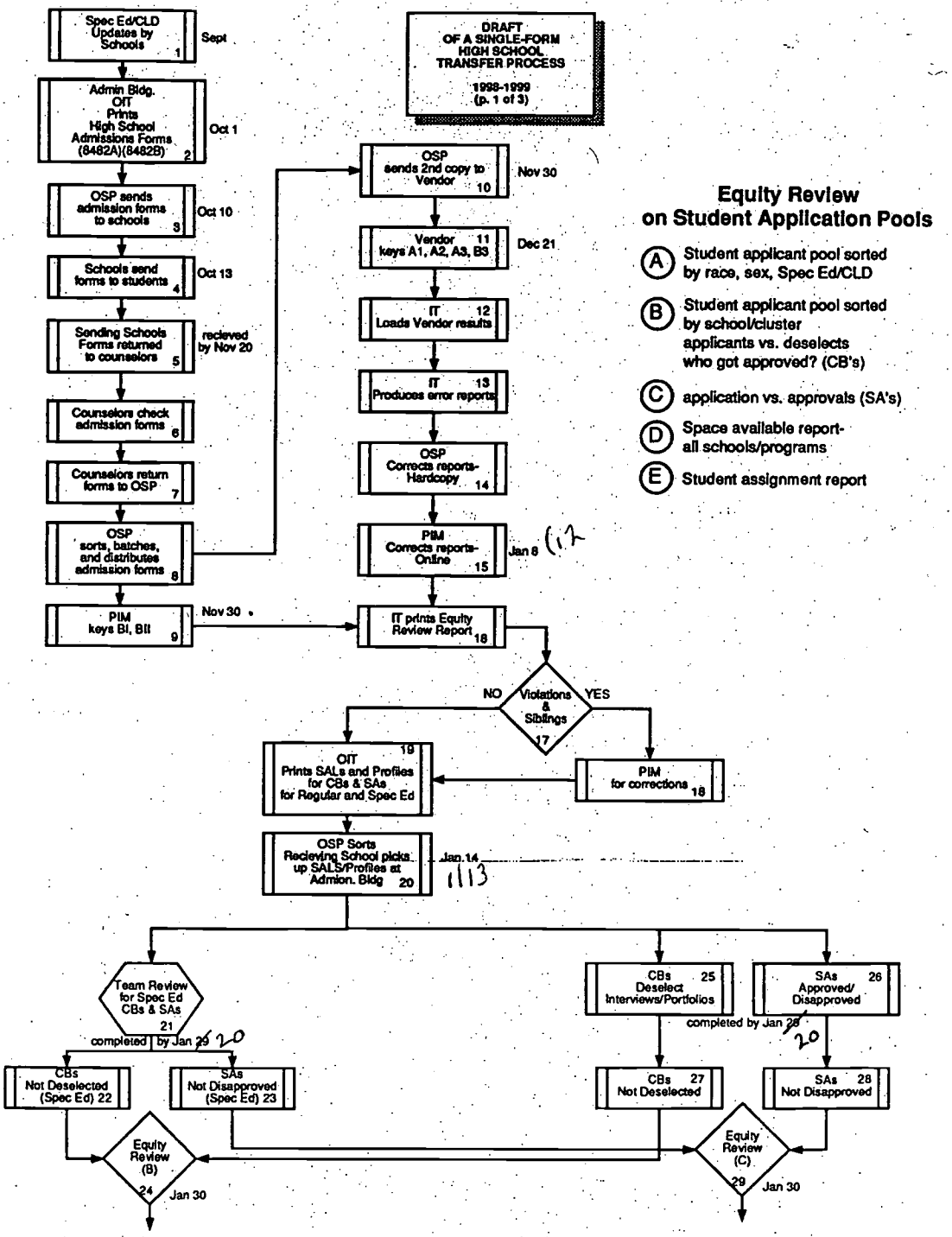
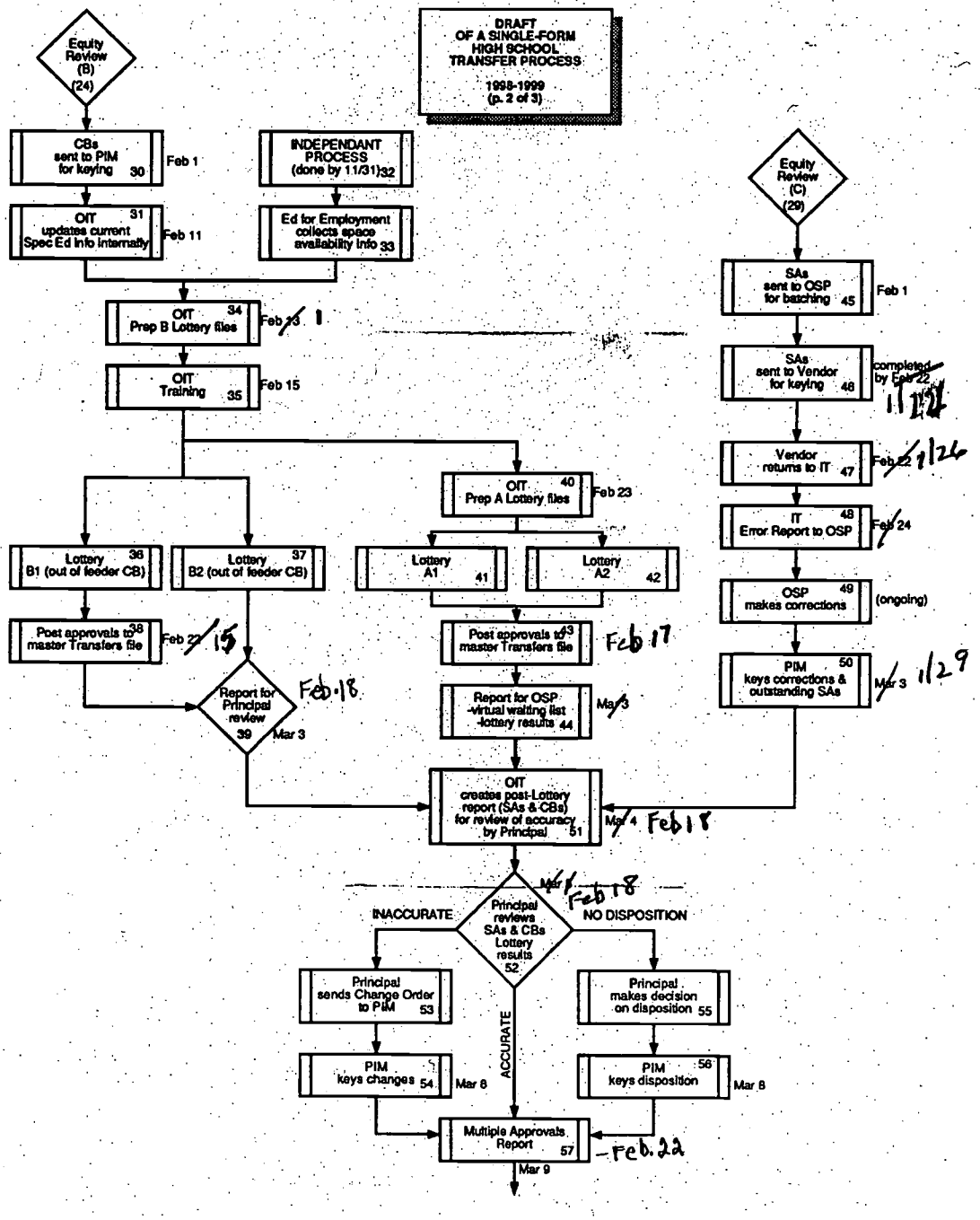
Appendix I: Draft of a Single-Form High School Transfer Process





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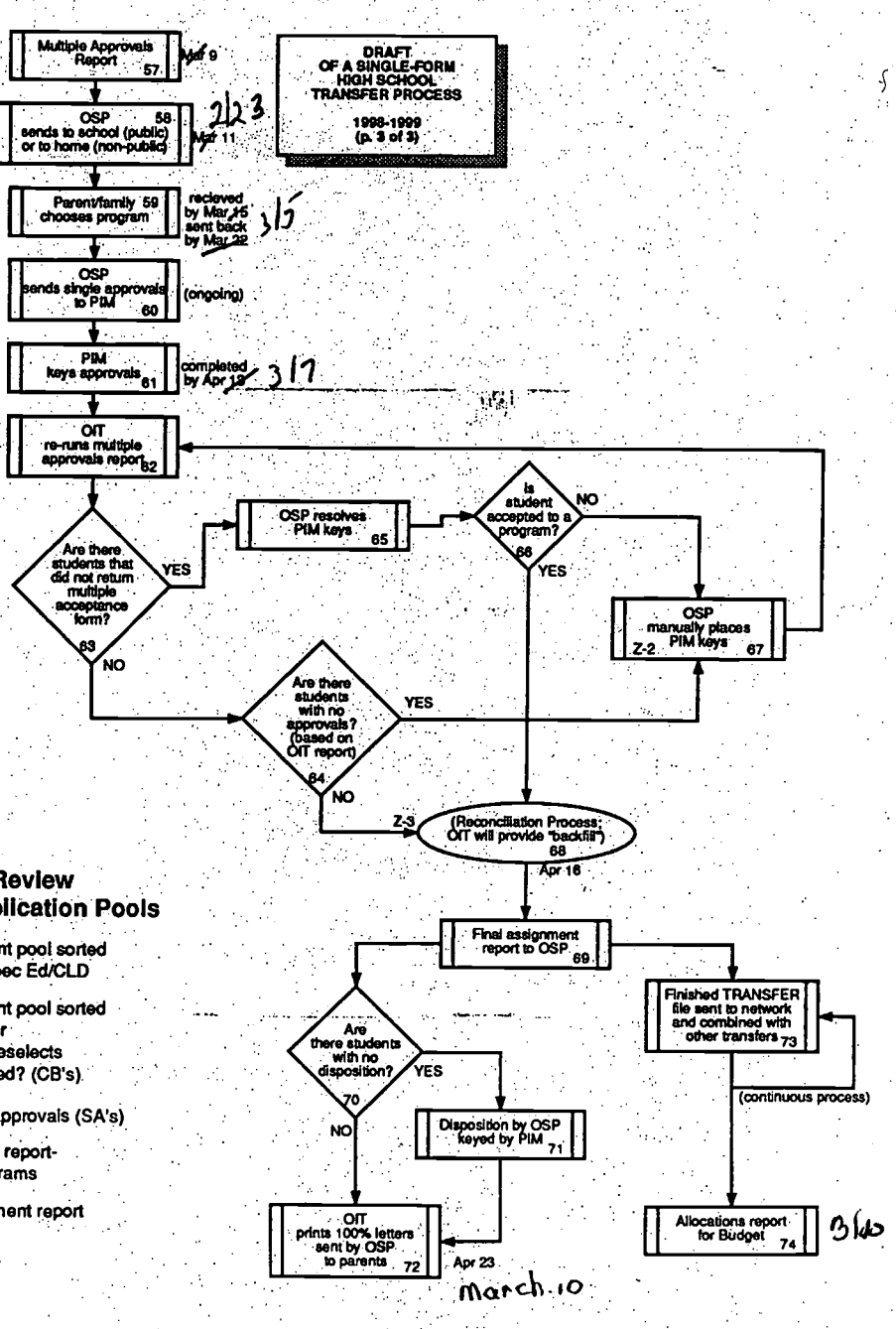

Equity Review on Student Application Pools

- (A) Student applicant pool sorted by race, sex, Spec Ed/CLD
- (B) Student applicant pool sorted by school/cluster applicants vs. deselects who got approved? (CB's)
- (C) application vs. approvals (SA's)
- (D) Space available report- all schools/programs
- (E) Student assignment report

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SCHOOL DISTRICT OF PHILADELPHIA

HIGH SCHOOL ADMISSIONS FORM

I.D. NO.: | RECEIVING GRADE: | PUBLIC | NON-PUBLIC

STUDENT NAME: | BIRTHDATE: | RACE/ETHNICITY: | SEX:

STUDENT ADDRESS: | TELEPHONE: | DESIRED TRANSFER DATE:

CURRENT SCHOOL: | CURRENT GRADE: | ROOM: | CLD/ESOL LEVEL: | SPECIAL ED: | EXCEPTIONALITY: | PRIM. ASSIGN.: | SUPPORT:

SECTION A: INSIDE FEEDER *(OPEN AND CRITERIA-BASED PROGRAMS)*
Please rank your choice in order of preference with your first choice as number 1, your second choice as number 2, and so on. If a selection is not made you will be assigned to a small learning community within your neighborhood high school

INDICATE PREFERENCE	SCHOOL CODE	SCHOOL / SLC NAME	PROGRAMS: OPEN	PROGRAMS: CRITERIA-BASED

SECTION C: RANKING
Please list your top two choices on Section A and B in the order you want them. Rank your choices in order of preference from 1 to 4 with your first choice as number 1, your second choice as number 2, and so on. Refer to the High School Resource Book for the correct school code(s) to be written

SECTION	SCH. CODE	PREFERENCE	RANK

SECTION D: SPECIAL ADMISSION PROGRAMS *(OPTIONAL)*
Please place a check mark next to any of these Special Admission Schools/Programs to which you wish to apply. Please do not check more than 10 choices in this section.

SCH. CODE	SCHOOL/PROGRAM	TO APPLY
2105	AUDENRIED MOTIVATION	
1016	BARTRAM MOTIVATION	
5100	BODINE - INTERNATIONAL AFFAIRS	
4030	CARVER - ENGINEERING/SCIENCE	
6010	CENTRAL	
3025	EDISON/FARERA MOTIVATION	
2290	FRANKLIN LEARNING CENTER	

(CHOOSE ONE)
PROGRAM CODES:
AR - ART
AY - ACADEMY/COLLEGE PREP
CX - COMMUNICATIONS TECHNOLOGY
VO - COMPUTER & BUSINESS APPLICATION
DA - DANCE
DR - DRAMA
HS - HEALTH SCIENCE
MI - INSTRUMENTAL MUSIC
VS - VOCAL MUSIC

2016	FRANKLIN MOTIVATION	
6640	GERMANTOWN MOTIVATION	
5230	GIRARD ACADEMIC MUSIC PROGRAM	
6080	HIGH SCHOOL FOR GIRLS (PHILA.)	

SCH. CODE	SCHOOL/PROGRAM	TO APPLY
2030	HIGH SCHOOL FOR CREATIVE AND PERFORMING ARTS	

(CHOOSE ONE)
PROGRAM CODES:
CW - CREATIVE WRITING
DA - DANCE
DR - DRAMA
MI - INSTRUMENTAL MUSIC
VA - VISUAL ARTS
VS - VOCAL MUSIC

2140	MASTERMAN	
5020	NORTHEAST MEDICAL/ENGINEERING/ AEROSPACE MAGNET	
403A	OVERBROOK SCHOLARS MAGNET	
4030	OVERBROOK MUSIC MAGNET	
403F	OVERBROOK FINE ARTS MAGNET	
4035	OVERBROOK MOTIVATION	
8671	PARKWAY - CENTER CITY	
8673	PARKWAY - GAMMA	
8670	PARKWAY - NORTHWEST	
6140	STRAWBERRY MANSION MOTIVATION	
1695	UNIVERSITY CITY MOTIVATION	

PLEASE COMPLETE THIS FORM AND RETURN IT TO THE SCHOOL COUNSELOR BY NOVEMBER 28, 1998.
FOR HELP IN SELECTION, MEET WITH THE COUNSELOR OR TEACHER.
FORMS MUST BE COMPLETED WITH A PARENT OR GUARDIAN'S SIGNATURE AND THE DATE.

INSTRUCTIONS

Each student should complete only one application for admission to high school. Please return the application to the school counselor on or before November 28, 1998. For help in selections, refer to the High School Resource Book.

Step 1. - Public school students should review all information on the **High School Admissions Form**, (name, address, sex, race/ethnicity, etc.), and the **Student Data Profile Form** (grades, attendance, test scores, etc.)

Step 2. - If any information is incorrect or missing on either form, contact the counselor. The counselor will correct the information.

Step 3. - Non-Public School Students must complete the **High School Admissions Form** and the **Student Data Profile Form**. Forms can be returned to a school counselor at a local public high school or to the Office of Student Placement. Please note that a Student Data Profile Form must be submitted for **each** special admission school or motivation/magnet program to which you apply.

Step 4. - **SECTION A.** Review all open and criteria based programs offered in your neighborhood school. Refer to the High School Resource Book for descriptions of the programs. Follow the instructions as written in Section A on this form.

Step 5. - **SECTION B.** School programs shown in Section B - Outside Feeder, have indicated there are available spaces for students outside the neighborhood in the 1999-2000 school year. If you are interested in applying to an open or criteria based program outside of your neighborhood school, follow the instructions as written in Section B.

If any of the programs listed are in your neighborhood school, select them in Section A, not Section B.

You may also list in the last three shaded rows any open or criteria-based programs or schools which do not appear in Section B. Refer to the accompanying High School Brochure or the High School Resource Book for a list of those programs and schools. Follow the instructions as written in section B.

Step 6. - **SECTION C.** Please list your top two choices from both Section A and B in the order you want them. Rank your choices in order of preference from 1 to 4 with your first choice as number 1, your second choice as number 2, and so on. Refer to the High School Resource Book for the correct school code.

Step 7. - **SECTION D.** Refer to the High School Resource Book for the descriptions and criteria for special admission schools and motivation/magnet programs. Follow the instructions as written in Section D.

Step 8. - Go back to Section A, B, C and D on the Admissions Form to check for errors or omissions. The **High School Admissions Form** and **Student Data Profile(s)** should be returned to a school counselor on or before **November 28, 1998.**

SECTION B: OUTSIDE FEEDER *(OPEN AND CRITERIA-BASED PROGRAMS - OPTIONAL)*
These schools and programs have space for students outside their neighborhood. Please rank your choices in order of preference with your first choice as number 1, your second choice as number 2, and so on.

If any of the programs listed are in your neighborhood school, select them in Section A, not Section B.

You may add any open or criteria based programs and motivation/magnet schools that do not appear here. These programs may or may not have spaces in the 1999-2000 school year. If space becomes available, assignments will be made. Please do not rank more than ten (10) schools in this section. Any schools after the 10th choice cannot be processed.

RANK	CODE	SCHOOL / SLC NAME	PROGRAMS: OPEN	PROGRAMS: CRITERIA-BASED
	101B	BARTRAM BUSINESS		✓
	101C	BARTRAM COMMUNICATIONS ACADEMY		✓
	2080	BOK	✓	
	4060	DOBBINS		✓
	5027	EDISON ELECTRICAL ACADEMY		✓
	201B	FRANKLIN MARITIME, COMMERCE & TRADE	✓	
	201C	FRANKLIN LAW & PUBLIC SERVICE	✓	
	201S	FRANKLIN EARLY CHILDHOOD & EDUCATION	✓	
	2012	FRANKLIN HOTEL/RESTAURANT/TOURISM	✓	
	2017	FRANKLIN FITNESS, HEALTH & SPORTS	✓	
	215V	FURNESS VENTURING INTO PROFESSIONS	✓	
	215H	FURNESS HUMANITIES	✓	
	215M	FURNESS MULTICULTURAL	✓	
	2161	FURNESS LAW/CRIMINAL JUSTICE ACADEMY	✓	
	501A	LINCOLN DESIGN & TECHNOLOGY		✓
	501B	LINCOLN BUSINESS TECHNOLOGY		✓
	501F	LINCOLN FAST TRACK (SWENSON)		✓
	501B	LINCOLN HEALTHY CHOICES		✓
	501D	LINCOLN ARTS INITIATIVE		✓
	501E	LINCOLN ENVIRONMENTAL SCIENCE ACADEMY		✓
	5017	LINCOLN HORTICULTURAL ACADEMY		✓
	5017	LINCOLN TEMPLE CONNECTION		✓
	6060	MASTBAUM		✓
	603C	ROXBOROUGH TRAVEL & TOURISM	✓	
	6032	ROXBOROUGH COMMUNICATION CORPS		✓
	6034	ROXBOROUGH HI-TECH ACADEMICS		✓
	6037	ROXBOROUGH BUSINESS ACADEMY		✓
	6040	SAUL		✓
	6035	WASHINGTON APPLIED ELECTRICAL ACADEMY		✓
	6037	WASHINGTON BUSINESS ACADEMY		✓
	6035	WASHINGTON HOTEL/RESTAURANT/TOURISM ACADEMY		✓
	6037	WASHINGTON HI-TECH		✓
	1023	WEST PHILADELPHIA AUTOMOTIVE ACADEMY		✓
	1025	WEST PHILADELPHIA AVIATION/AEROSPACE ACADEMY		✓
	1024	WEST PHILADELPHIA HOTEL/RESTAURANT/TOURISM ACADEMY		✓
	504M	WILLIAM PENN MASTERMINDS		✓
	504A	WILLIAM PENN ARTS		✓
	504C	WILLIAM PENN COMMUNICATIONS MAGNET		✓
	5047	WILLIAM PENN BUSINESS ACADEMY		✓
	5042	WILLIAM PENN HEALTH ACADEMY		✓

PARENT/GUARDIAN STATEMENT: I have received information and assistance from the school in the selection of appropriate high school programs for my child. Please check: YES NO

PARENT/GUARDIAN SIGNATURE: _____ DATE: _____

BATCH NUMBER

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